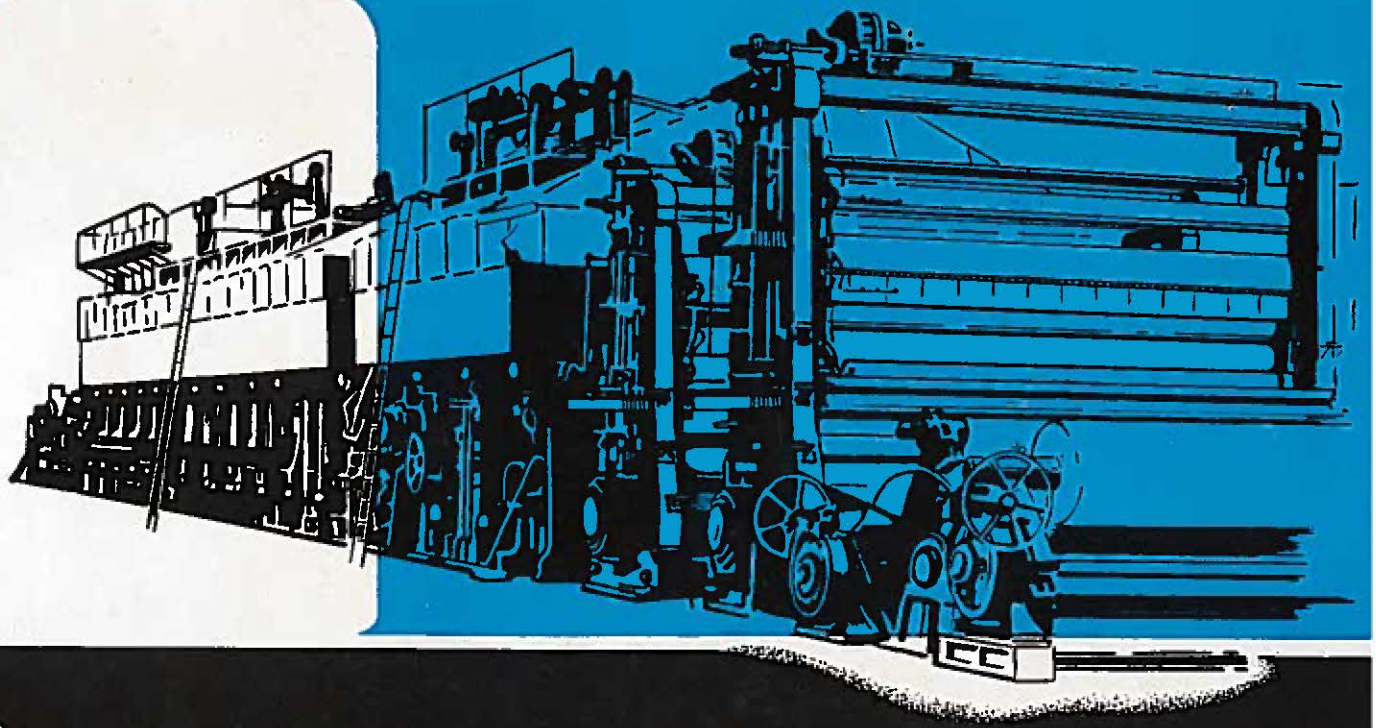
LUBRICATION

of

BAGLEY & SEWALL

PAPER MAKING MACHINES



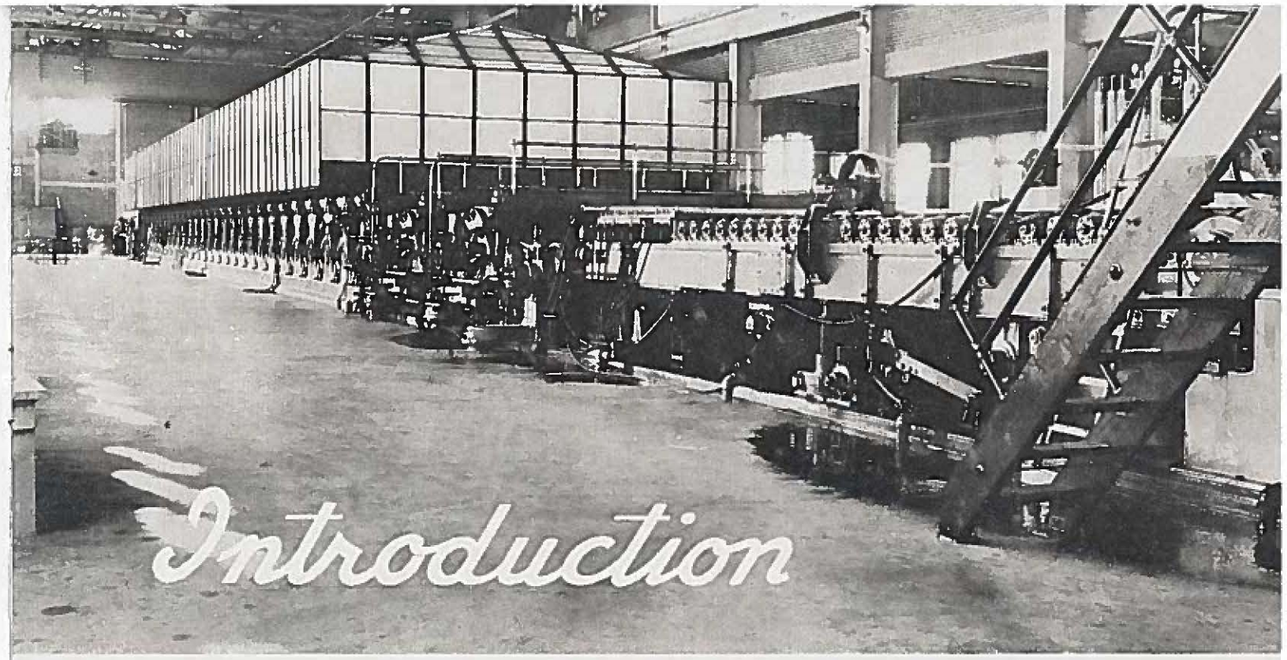
BAGLEY B&S SEWALL

THE BAGLEY & SEWALL COMPANY

WATERTOWN, NEW YORK

BAGLEY

SEWALL



Introduction

Production of paper in this country has shown consistent growth and unless all present indications fail, paper tonnage will reach new high levels during the next few years. In building paper making machines to meet this growth trend the need has ever been for greater production with better quality and lower manufacturing costs. The insistent demand for higher quality at lower cost has been satisfied only by steadily higher speeds, increased machine widths and better methods of construction.

As every paper mill owner and operator will recognize continued high productivity can be achieved only when lubrication of machine elements is fully effective and excessive wear eliminated. Otherwise the loss of productive time required by necessary maintenance and repairs may seriously reduce machine output. Furthermore, good lubrication is essential to good quality of paper because it permits smooth vibration-free motion, which is necessary for uniformity in weight, strength and texture.

To realize the high efficiency in lubrication that is required for modern production demands, the Bagley and Sewall Company have developed designs and methods which assure effectiveness and dependability with a minimum of attention and supervision. It is highly desirable, however, that the care devoted to lubrication be intelligently directed and regularly maintained. For this purpose we have compiled information on the following pages designed to assist the operator in keeping lubrication on a sound and practical basis. If you have requirements of a special nature not treated in this booket we shall be glad to offer upon request the expert counsel of our engineering staff.

THE BAGLEY & SEWALL COMPANY

Builders of Paper Making Machinery

WATERTOWN, NEW YORK

INCREASED PRODUCTION PROFITS WITH PROPER LUBRICATION

Important savings in operating costs with corresponding gains in production profits are often possible through improved lubrication practice. This improvement will ordinarily lie in choice of lubricant for each element, how it is applied and the supervisory attention devoted to the various requirements. The economies secured are both immediate and long term in nature. The overall gains may offset many times over any increased effort or expense the change in lubrication procedure may entail. The major benefits to be obtained are discussed at further length under the following headings:

PRODUCTION OF MAXIMUM TONNAGE:

Because the manufacture of paper is a continuous and coordinated process any factor which acts to slow down one element automatically reduces entire output of the machine in the same degree. Proper lubrication helps to keep all parts running at the speed desired and thereby contributes to a continuously high rate of production. Furthermore it assists in keeping the amount of "broke"—caused when the strip of paper breaks due to irregularities in the manufacturing process—at a minimum and lessens the production time lost as a result of stoppages.

HIGH QUALITY AND UNIFORMITY OF PRODUCT:

Proper lubrication helps to maintain the desired standards of quality and uniformity in paper production. By promoting smooth free movement of rolls and keeping vibration at a minimum the conditions are established for uniform distribution of fibres and the formation of a paper strip having the necessary evenness of texture. Lack of lubrication or excessive wear create irregularities in movement or vibration of machine parts which are reflected in lowered quality of the paper produced.

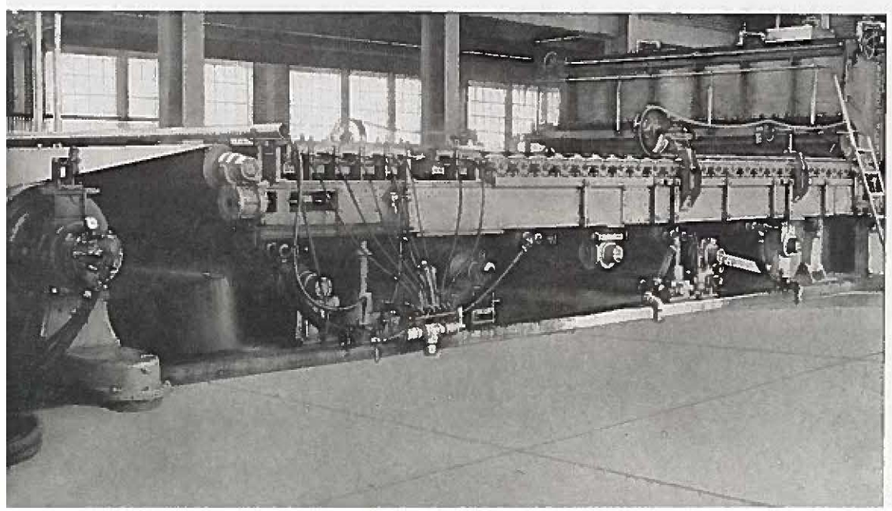
REDUCTION IN MAINTENANCE COSTS:

A sizable portion of the repairs and replacements required by a paper machine is caused by wear on moving surfaces in contact. When lubrication is not fully effective the rate of wear is likely to be high and maintenance costs correspondingly increased. Better attention to lubricating requirements will often pay worthwhile dividends. The savings may not be immediately apparent, but when maintenance expense over the longer term is analyzed, the direct measurable gains may prove quite sizable.

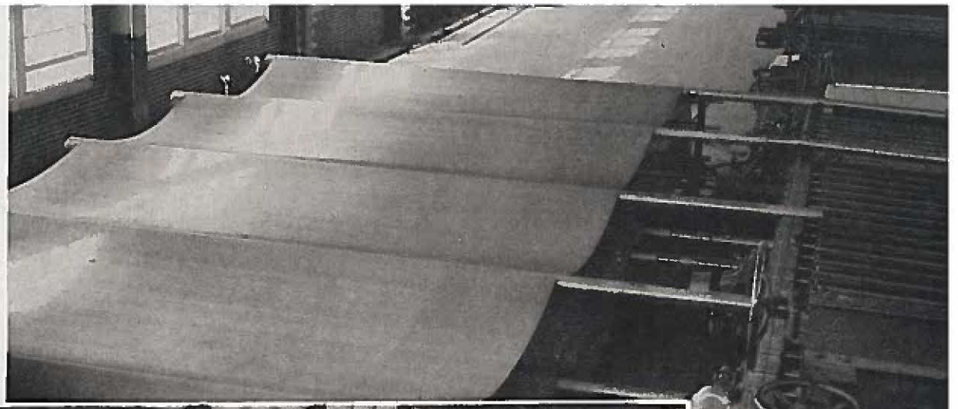
SAVINGS IN POWER:

Because the power needed to operate a paper machine is largely influenced by the friction load involved, the consumption will be lowest when friction is at a minimum. Lubricants which offer maximum resistance to metallic contact and a routine which assures continued maintenance of lubricating films on all rubbing surfaces combine to produce lowest frictional losses and minimum power costs per ton of paper produced.

The peak load demand at start-up can frequently be reduced by using lubricants better adapted to service requirements supplemented by the proper lubricating schedule. Such an improvement will not only save power but also lessen the strain on motors, machine bearings and gears.

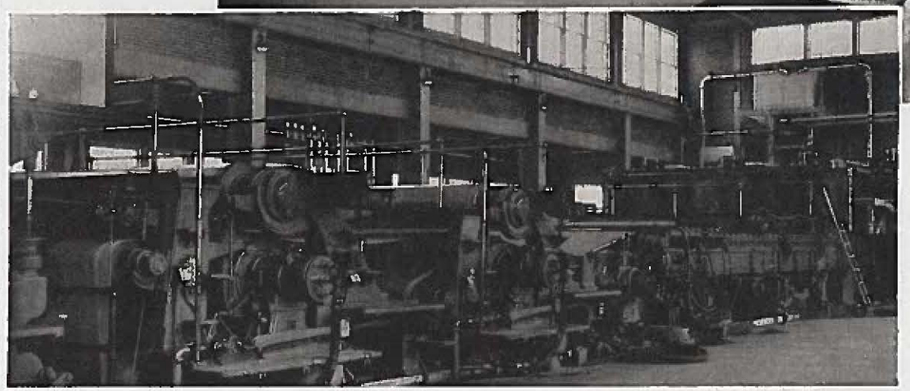


The Fourdrinier of Simplex design with Quick Wire Change.



Quick Wire Change

Simplex features permit wire changes to be made quickly and easily.



The Press Section

This consists of two suction presses followed by a smoothing press.

GENERAL HINTS ON OILING PRACTICE

In maintaining most effective lubrication of paper making machines, there are several factors of a general nature which have an important bearing on results secured. Their significance is so obvious that they may frequently be overlooked. We, therefore, wish to specifically emphasize these needs in the lubrication of Bagley & Sewall equipment.

REGULARITY:

Probably the primary requirement of a successful lubrication routine is regularity in service attention. The need for regularity lies in the fact that the lubricant constantly tends to escape or is otherwise consumed during operation. Replenishments must, therefore, be made on a regular basis if "starvation" of the parts is to be avoided. This statement holds good in degree for any method of application, either manual or automatic and using either oil or grease.

THOROUGHNESS:

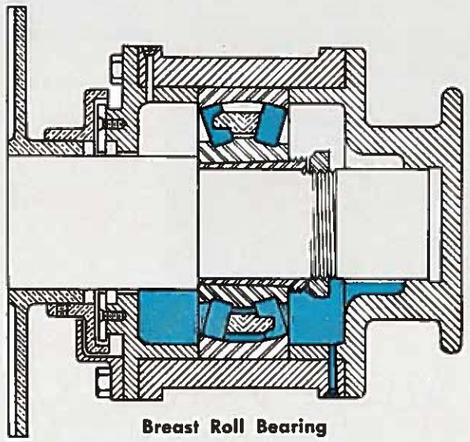
The principal point to be emphasized is that no oiling points can be missed or neglected if best results are to be secured. If, for example, in greasing the Fourdrinier one bearing or point of application is consistently overlooked, this condition will in time lead to failure with the possibility of considerable production time being lost. If this happens other gains from good lubricating practice may largely be cancelled. Therefore, we urge that every oiler or operator become thoroughly familiar with the lubricating requirements of the machines for which he is responsible, especially the number and location of oiling and greasing points. Some method of check-off or counting will be helpful against points being overlooked.

CLEANLINESS:

Every reasonable precaution should be taken to insure the lubricant reaching the parts in a clean, uncontaminated condition. Dirty oil or grease may prove little better than no lubricant at all, particularly if abrasive impurities are present. The first step is to protect against contamination during storage. A clean isolated room suitably arranged is much to be preferred for this purpose. Allowing the drums or containers to stand in the open or around the machine, offers many opportunities for grit, water, fibres, etc., to enter. Next, the dispensing equipment, such as oil cans and grease guns should be kept clean and free of dirt. Finally, the points of application or introduction should be wiped clean before oiling, so that no impurities are carried inward with the fresh lubricant.

GREASE LUBRICATION OF ANTI-FRICTION BEARINGS

Anti-friction bearings have clearly demonstrated their superiority over plain bearings for service in paper making machines. Ball or roller bearings as dictated by service conditions will show definite economies despite higher initial costs. Because of these advantages anti-friction bearings are standard for the great majority of bearing requirements on Bagley & Sewall equipment. On the Fourdrinier or



Breast Roll Bearing

cylinder, on the press parts and other elements as indicated on the Lubrication Chart, pages 14 and 15, independent grease lubrication of all anti-friction bearings by pressure gun is commonly employed. This method offers a high degree of dependability and reduces lubrication labor. The greasing needs of these bearings are relatively simple although it is essential that a few important directions be observed.

With normal mechanical conditions not much grease is consumed during operation and application about once every two weeks will ordinarily be sufficient. Certain bearings will need greasing not oftener than once monthly. For specific directions reader is referred to Lubrication Chart. Housings are generally equipped with vents or relief fittings and gun may be applied until some grease appears at the escape. Further application of the gun will serve no particular advantage and simply results in waste of the lubricant. Where bearings of sealed design are not equipped with means of pressure relief the grease gun should be applied sparingly and no attempt made to force in grease under high pressure. Bearings in this class should preferably be filled not more than 1/3 to 1/2 full. This will allow room for normal expansion of the grease during operation. Too much grease may cause the bearing to run hot and shorten useful life. Excessive internal pressure may even burst the seals and allow entrance of harmful impurities.

Anti-friction bearings will operate for long periods without attention other than lubrication at regular intervals as recommended. However, when maintenance work is being performed and the opportunity exists for taking the bearings down in that part of the machine affected, it is highly beneficial to remove the old lubricant, wash the bearing elements in solvent and then relubricate with fresh grease. Even with grease of the highest quality some deterioration and stiffening or caking will occur with time and use. Furthermore small quantities of abrasive material may unavoidably gain entrance. Cleaning as recommended will help to restore desired conditions and in general promote longest bearing life.

The grease used should be of the type which is especially made for service in anti-friction bearings. It should resist deterioration, separation or caking and not contain any ingredients harmful to the high finish of ball or roller bearings. Grease in the form generally employed for bearing lubrication represents a

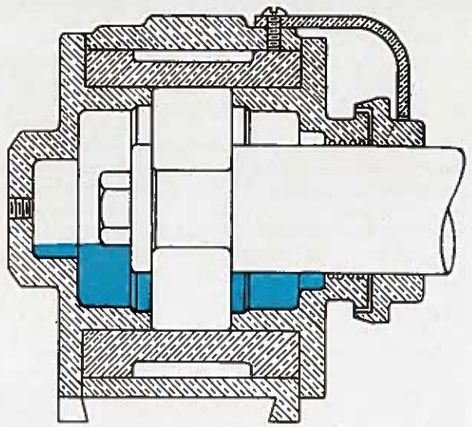


Table Roll Bearing

mechanical mixture of oil and soap. The type and quality of these ingredients, their percentage and the steps taken in compounding, determine the performance characteristics. Because of the excessive water conditions prevailing in the Fourdrinier and press parts it is suggested that the grease employed be water repellent in nature such as is made from a lime soap base. The grease should be medium soft, i.e., a No. 2 grade consistency, suitable for convenient handling and introduction by pressure gun.

CIRCULATION OILING OF DRYER SECTION

The advantages of circulation oiling for dryer bearings and gears have been so well established that practically all new machines are equipped with this method of lubrication. Furthermore, many older installations employing obsolete methods of oiling have been modernized by incorporating a circulation system which provides delivery of oil under pressure to dryer parts. Where plain bearing construction is employed supplementary ring oilers are used to carry oil to the dryer journals. Bearings of the breast and couch rolls, also those of the press rolls may be connected to the same circulation system which serves the dryers with attendant benefits to be gained for these heavier duty elements.

Although details and arrangement of the circulation system are likely to vary on different machines, in general it consists of an independently driven pump or pumps which pick up oil from a reservoir, force it through a filter and then deliver to a header where still under pressure, it is distributed via leads to the various bearings and points of gear mesh. Diagrams on page 7 illustrate delivery of oil to bearings and gears on a typical installation. After the purpose of lubrication and cooling has been served, the oil flows by gravity to a reservoir or storage tank. Usually compartments or multiple tanks are employed so that the oil has a period of relative quiet to allow water and impurities to settle out.

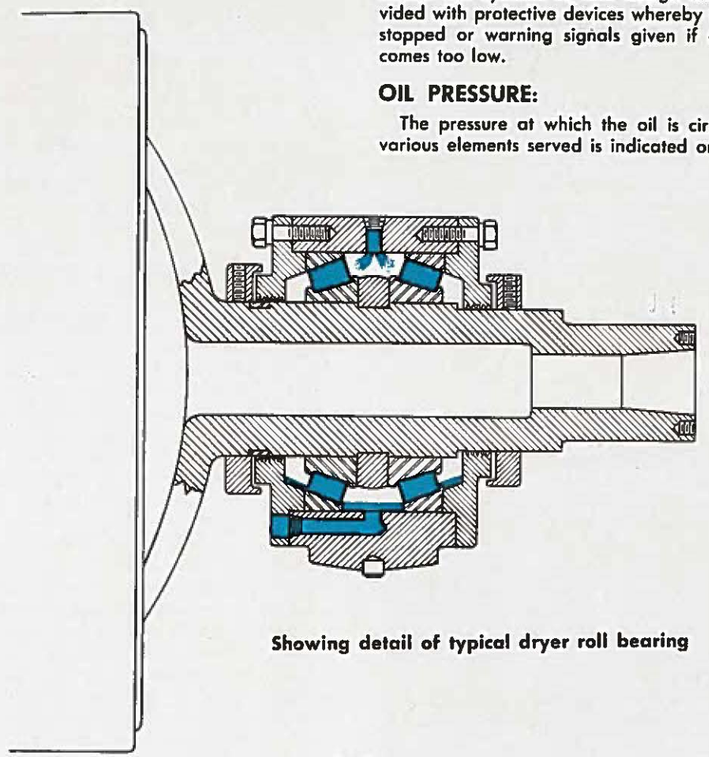
Instructions for operation, supervision and conditioning of system will usually be provided by the supplier for each installation. For maximum efficiency it is important that these instructions be carefully observed. Because of the necessary variety in system design no standard set of directions can be offered. However, there are several operating requirements of a general nature as follows which are worthy of careful attention by the mill owner and operator.

OIL SUPPLY OR LEVEL:

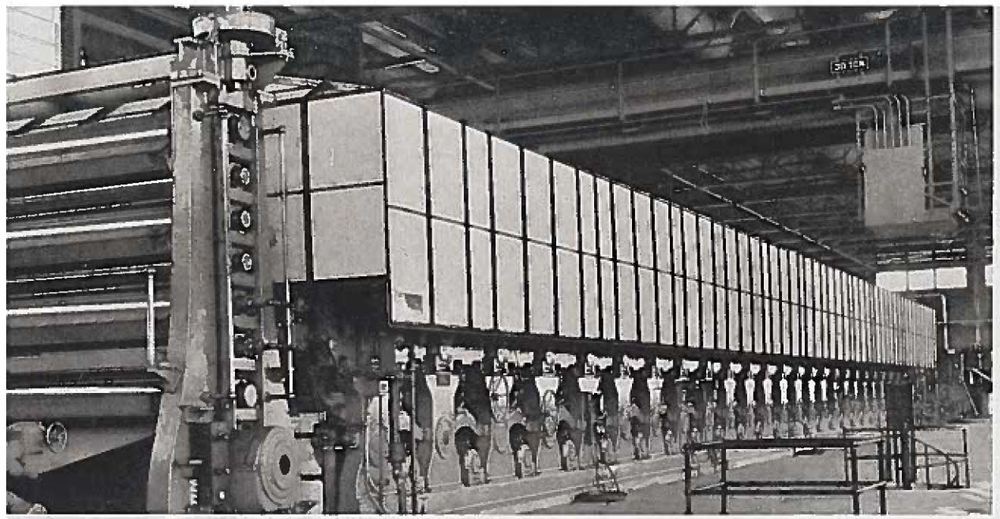
The level should be checked regularly (ordinarily once daily is desirable), and fresh oil added as make-up when needed. When system is maintained in good condition and free from leaks not much oil will be lost or consumed during operation and only small quantities of make-up will be required. However, if level is neglected and supply drops until pump intake is uncovered, then all lubrication will cease. The systems of late design are usually provided with protective devices whereby the machine is stopped or warning signals given if oil supply becomes too low.

OIL PRESSURE:

The pressure at which the oil is circulated to the various elements served is indicated on one or more



Showing detail of typical dryer roll bearing

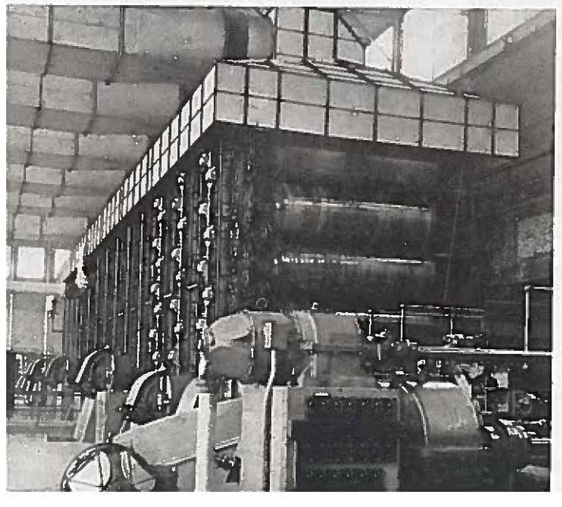


Dryer Section

gauges suitably located for convenient inspection. Because the pressure indicates in relative measure the quantity of oil being circulated it is desirable to keep the gauges under observation. Any sustained fall in pressure should be investigated without delay and the cause corrected. The normal pressure range will vary between different installations depending upon design factors and for that reason it is not feasible to specify limits. The protective devices mentioned in preceding section may also be arranged to function if pressure falls below a set minimum.

CONDITIONING OF SYSTEM:

Keeping the oil in a clean condition and the system free of any sizable collections of water and impurities is an important consideration in obtaining most effective lubrication. Generally speaking the necessary procedure will involve regular cleaning or renewal of the filtering element, drawing off accumulated water, removing settled impurities and cleaning reservoirs as needed. Specific instructions for each installation will be supplied by the manufacturer and it is desirable that the recommended procedure be followed closely.



Dryer Drive for a stack dryer section

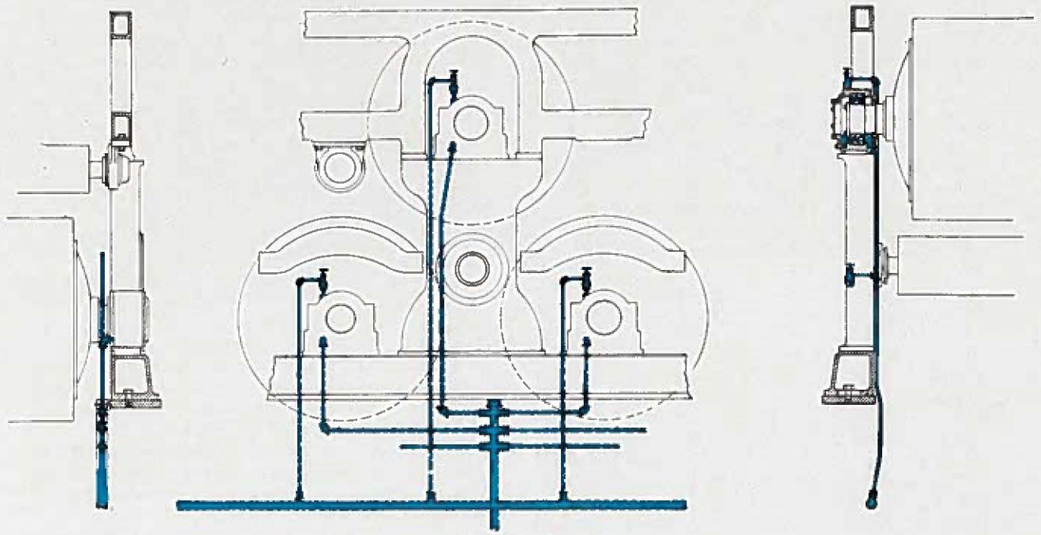
OIL CHANGES:

If an oil of good quality suitably refined for service in circulation systems is employed the useful life of the lubricant may be quite long, particularly if any sizable quantities of make-up are added as these additions act to sweeten the charge. However, to guard against the oil becoming too contaminated or deteriorated in quality for dependable lubrication, it is suggested that sample be analyzed every three to six months and a report obtained on suitability for continued use. Frequently a charge of oil may last for several years without the need for changing. However, when the concentration of contaminants or oxidized portions becomes so great that reliable performance cannot be assured, the system should be drained and a fresh batch of oil introduced, otherwise difficulties of an expensive and troublesome nature may develop.

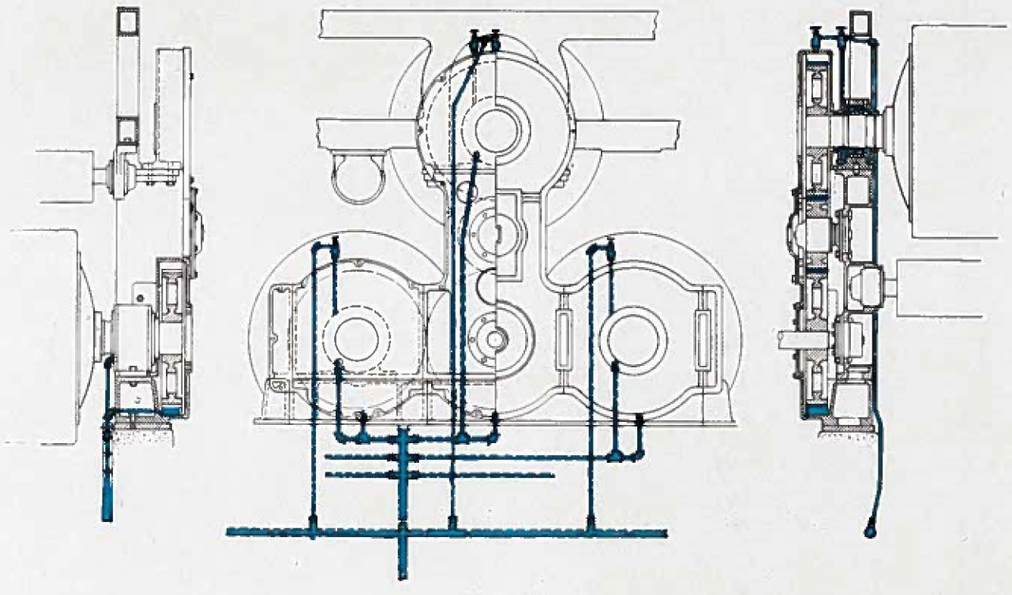
QUALITIES DESIRED IN CIRCULATING OILS:

Ordinary oils will not stand up dependably for long periods in circulating service on dryers. Constant circulation in the presence of heat, water and contaminants exerts a strong oxidizing and deteriorating action upon the lubricant. Unless the oil is properly refined to resist these influences, troublesome conditions in the form of sludge, deposits and thickening may be experienced relatively soon. Good demulsibility, i.e., the ability to separate readily from water is also desirable for best results, otherwise the oil may form emulsions which seriously impair circulating and lubricating qualities, clog the filter elements and increase the attention necessary. It is important that users keep these requirements in mind. High quality products having the properties essential for circulation service will definitely prove the most economical and satisfactory in the long run. Correct body or viscosity will depend upon the actual operating temperature of the oil within the system. For suitable selection according to temperature range encountered refer to Lubrication Chart on page 14.

DIAGRAMS SHOWING LUBRICATION OF DRYER SECTION



Front Side



Back Side

LUBRICATION OF GEAR DRIVES

Bagley and Sewall mechanical gear drives are built as a self-contained unit and equipped with a fully enclosed oil-tight housing. Accurately cut spiral bevel or hypoid gears mounted on shafts supported by anti-friction bearings assure positive and efficient transmission of power. The hypoid drive is built in the single reduction type and the spiral bevel in both the single and compound reduction types.

Lubrication of these gear units is accomplished by a combination splash and circulation oiling system, as illustrated in diagram below. A positive force feed oil pump picks up oil from the reservoir in the bottom of the gear housing and delivers it to an oil cup on the top of the unit where it flows by gravity through individual leads with sight glasses to the bearings and point of gear mesh. The used oil returns to the reservoir where it is recycled by the pump. In addition to delivery of oil by circulation the driven gear dips into the oil held in the reservoir and creates a splash which furnishes additional lubrication to bearings and gears. Thus an ample supply of oil is assured for every point under all conditions of load and speed. It is also feasible to supply all the gear drives on a paper machine by one central circulation system rather than by individual circulation on each unit. Such a system will approach the size and scope of dryer oiling and details of arrangement will vary with each installation.

SERVICE INSTRUCTIONS:

Generally considered, the same basic instructions apply as outlined for the circulation system on the dryer section.

(1) The level must be checked regularly and fresh oil added as needed to maintain the proper height. This check should be made once every two weeks or more often if experience proves it desirable. At the same time inspect the flow through each sight glass to make certain all parts are receiving adequate lubrication. No particular benefit will be obtained by raising the level or adding more oil than needed. In fact, this practice may cause the gear drive to run hotter than normal, may contribute to the creation of excessive foam and cause leakage of oil from the gear housing.

(2) Because of the severe service to which the oil in the gear drives are subjected, changes must be made regularly to assure effective lubrication. When a new drive is first started up the oil should be changed after the first month's operation and then after every six months. During the first month the gears are wearing in and a certain amount of flushing action goes on within the housing which results in contamination of the oil by metallic particles, core sand and other abrasive impurities. The oil should preferably be drained right after the machine has been shut down in order that contaminants may not have an opportunity to settle out.

(3) Outboard anti-friction bearings are equipped with pressure fittings and should be given a few shots of grease by gun every two weeks. Clutches of the type requiring lubrication should be serviced in accordance with instructions issued by the manufacturer.

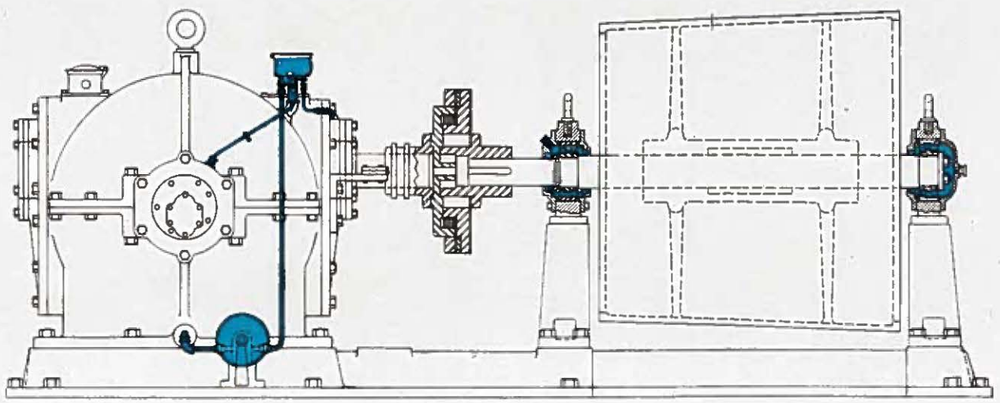
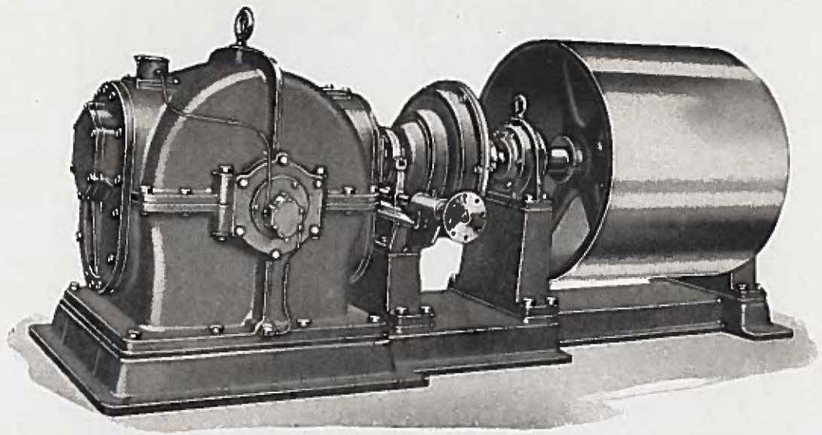


Diagram of lubrication system on hypoid single gear drive

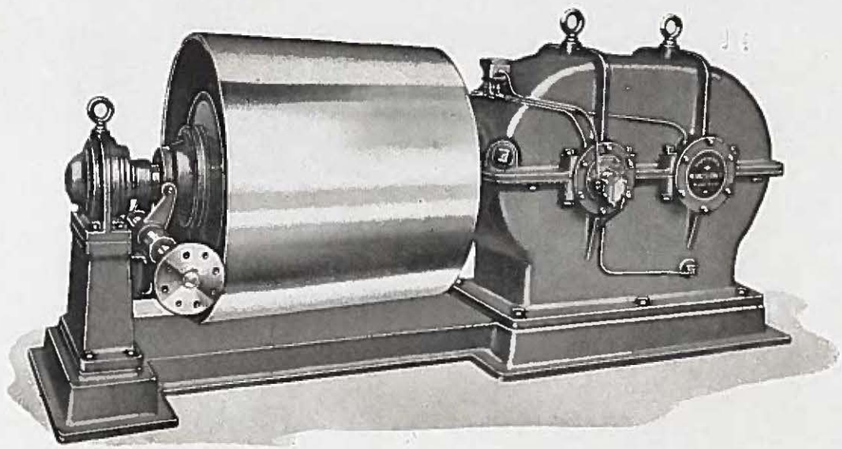


Hypoid Single Gear Drive

KIND OF OIL REQUIRED:

HYPOID GEARS. Except when lightly loaded these gears may develop a severe rubbing action and high unit pressures between the interfaces. This condition is characteristic of hypoid design and for adequate protection to tooth surfaces, a specially compounded gear oil having so-called "EP" or extreme pressure qualities is desirable to prevent possible scoring or welding. High quality is essential in order that the lubricant may stand up dependably without chemical breakdown or undue loss of original properties. Viscosity or body should be in the medium range. Very heavy oils should be avoided as they will not circulate and distribute properly to maintain a well lubricated and cool running drive.

SPIRAL BEVEL GEARS. A gear oil of high quality and medium body is suggested for drives of spiral bevel design. Lubricants having special compounding are not required for this class of duty. The oil should be of the type refined for circulation service and should possess high stability, good demulsibility and superior lubricating properties. In common with hypoid drives very heavy oils should not be employed as greater wear and hotter running may be experienced with their use.



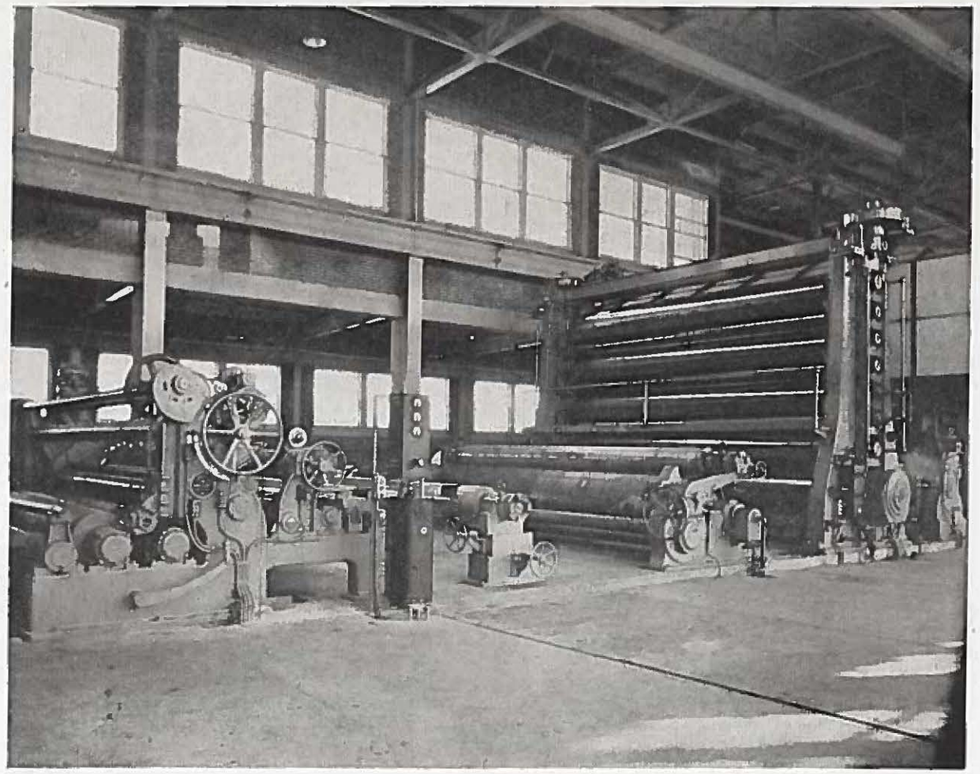
Compound, spiral bevel drive

CALENDER OILING

Modern high speed anti-friction bearing calenders are ordinarily equipped with a circulation oiling system having separate leads to each calender roll bearing as illustrated in diagram on page 11. Details of the system will vary depending upon operating requirements and either pressure delivery or gravity flow to the bearings may be employed. The system may form part of that serving the dryer bearings and gears with common pump and reservoir or may be completely integrated with separate pump and reservoir. For reasons evident from the foregoing description, service instructions for the system serving the calender will be comparable to those outlined for the dryer system and reader is referred to pages 5 and 6 for this information.

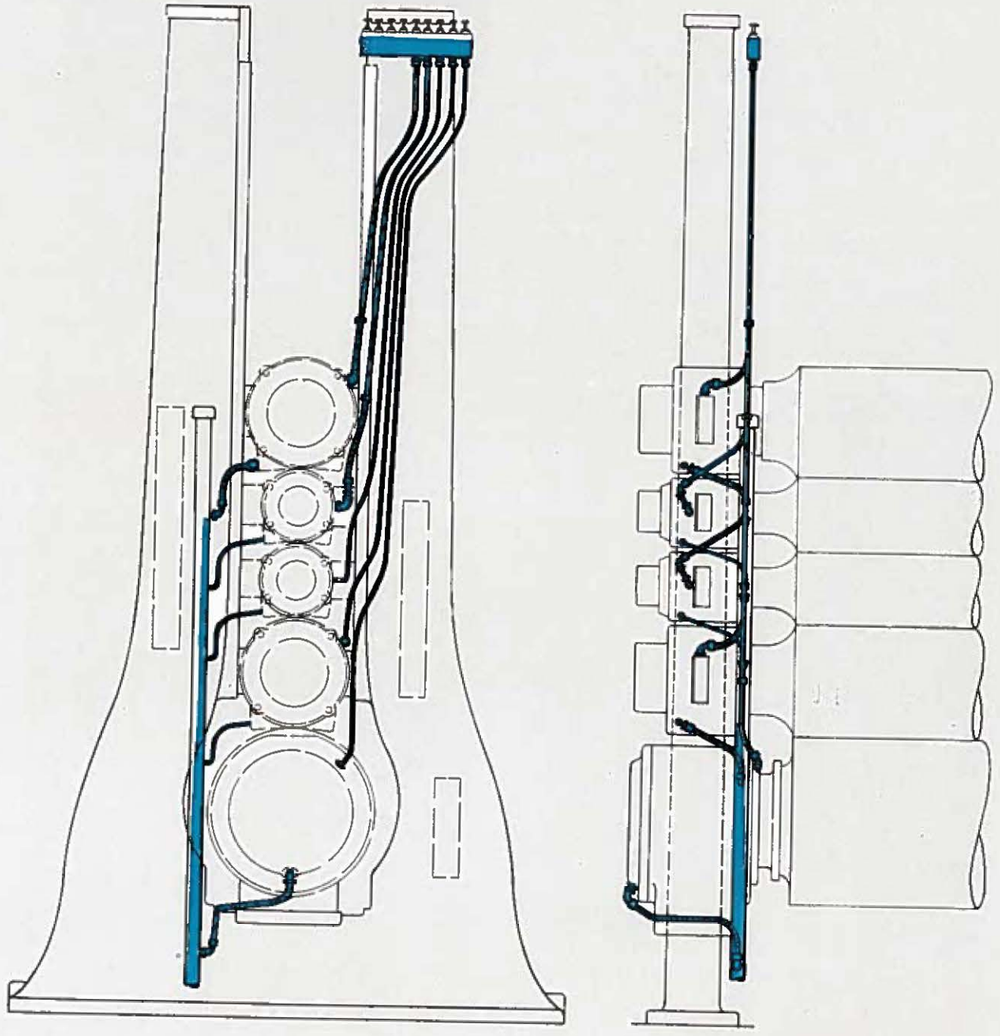
While it is not necessary to set feeds any higher than needed to maintain normal bearing temperatures, the top and bottom roll bearings, because of size and loading, will usually require a higher rate of feed than the intermediate rolls. As will be noted from diagram, each lead has means for individual adjustment of oil flow.

Calenders equipped with plain sleeve bearings are usually lubricated by ring or constant level oilers. No great amount of attention is required by these methods aside from occasional inspection to determine if rings are turning properly and regular examination of oil supply with replenishment as needed. Ordinarily, once every two weeks will be sufficient for checking oil supply, although more often may be found desirable in the case of constant level oilers. Lubricant requirements for calenders are in general similar to those for dryers and product recommended for oil temperatures below 150° F. will be suitable.



Calender, reel and winding unit

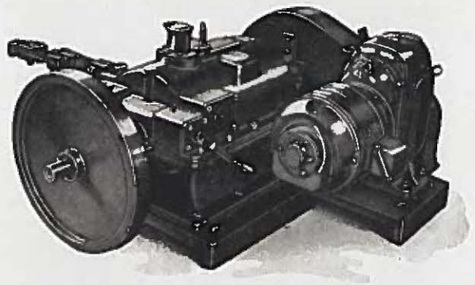
DIAGRAM OF
CALENDER OILING SYSTEM



MISCELLANEOUS REQUIREMENTS

SIMPLEX SHAKE

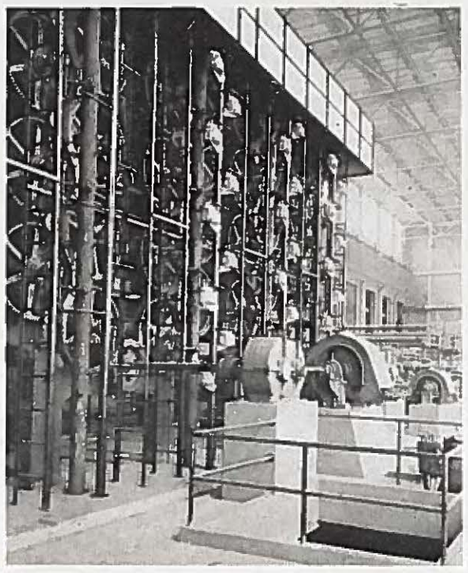
This unit is equipped with a small self-contained circulation oiling system for serving all internal parts. Pertinent service instructions are to check the oil level regularly every two weeks, change at the end of the first month's operation and then every six months. Because of smaller clearances and relatively high speed of operation a somewhat lighter oil is suggested for the shake unit than employed for other circulating requirements on the paper machine. If a rise above normal in operating temperature of the shake unit occurs this may be due to the oil being too heavy in body or in poor condition.



The Simplex Shake

STEAM JOINTS

Our new "PARAMOUNT" steam joint is roller bearing equipped and lubricated with grease by pressure gun. Because this joint is subjected to temperatures approximating that of the incoming steam, a grease made for high temperature service is essential for best operating results. Application of grease about once every two weeks is recommended to assure adequate protection to the roller bearing.



Showing open gears on dryer section

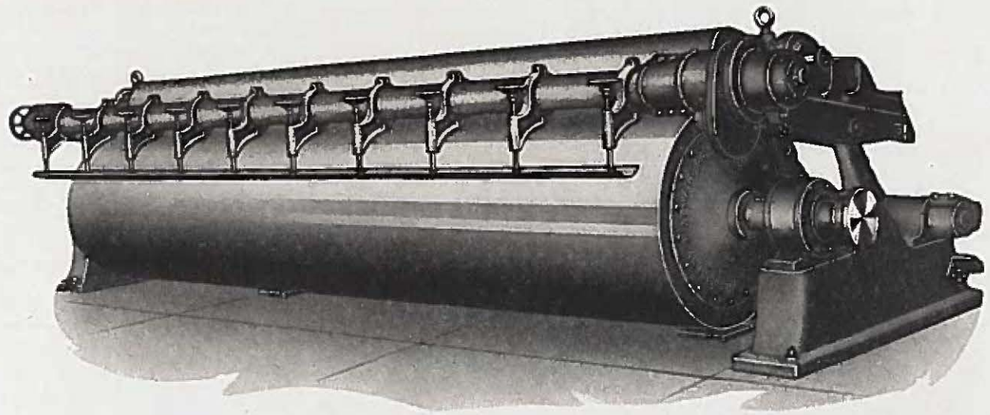
OPEN DRYER GEARS

On older or slower speed machines open construction of the dryer gears is likely to be encountered. This design will require manual application of a lubricant at intervals of about every two weeks. An adhesive tacky oil is required in order for it to stay on and adhere to the teeth when the gears turn at normal speeds. In the chart on page 14 we have specified a product which has been thinned down by solvent and allows convenient application by brush swab or oil can, without prior warming. When exposed to the air the solent evaporates leaving the oil in its original tacky form. For best results, it is advisable to apply the oil during shut-down. Gears should be cleaned of accumulations before fresh lubricant is applied and all teeth coated with oil rather than depend upon rotation of the gear to distribute the lubricant.

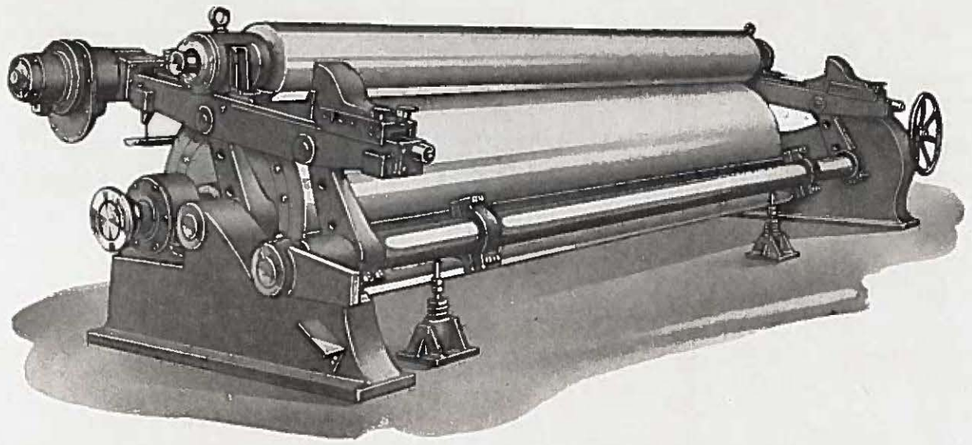
DOCTOR OSCILLATOR WORM

The worm and gear driving the doctor oscillator is lubricated by dipping in oil contained in the gear housing. Level should be checked every two weeks and oil changes made every six months. Satisfactory lubrication of these gears requires a fluid oil, but heavier in body than normally used on other machine requirements. Lighter grades may permit a relatively high rate of wear on tooth surfaces.

THE BAGLEY AND SEWALL *Automatic* UNIFORM SPEED REEL



Front View



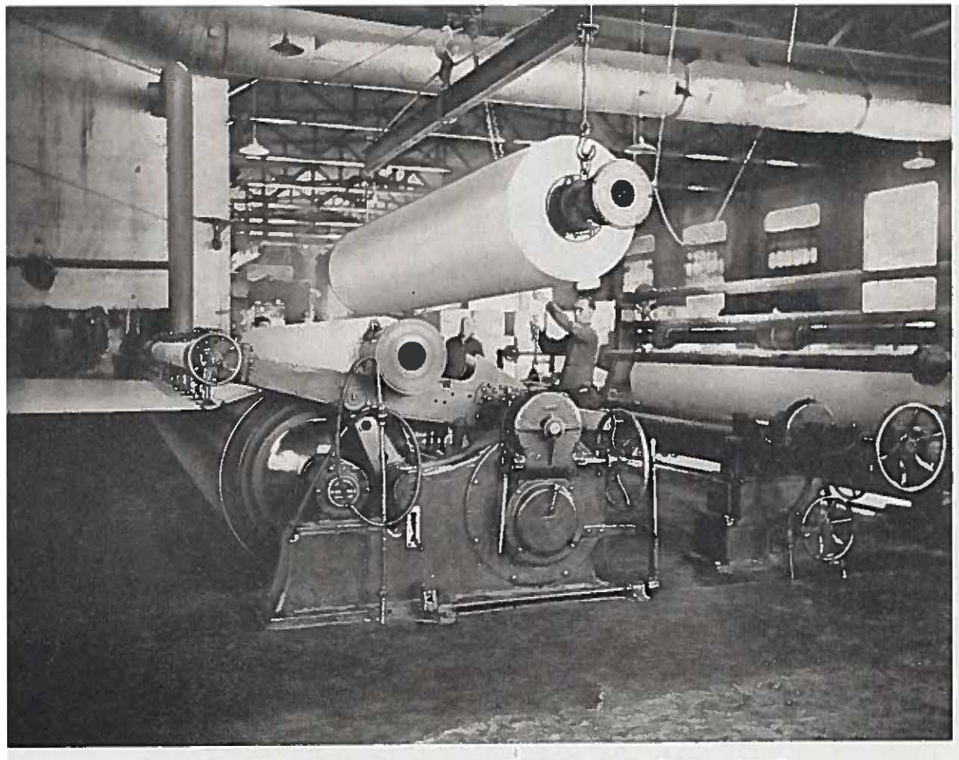
Back View

LUBRICATION CHART

Machine Parts	Type or Design	Method of Lubrication	Recommended Grade	Service Instructions
FOURDRINIER				
Breast Rolls Couch Rolls	Anti-friction	Pressure fittings Circulation	Gargoyle Grease AA No. 2 Gargoyle D.T.E. Oil Extra Heavy	Apply grease gun every two weeks See directions issued by supplier, also general instructions on pages 5 and 6 of this booklet
Dandy Rolls	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
Table Rolls	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
Wire Rolls	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
Shake Units	"Simplex"	Circulation	Gargoyle D.T.E. Oil Heavy Medium	Check oil level every two weeks and add fresh oil as needed. Change oil at end of first month's operation and then every six months
CYLINDER				
Couch Roll Cylinder Mould Felt Roll Suction Drum Roll Whipper Squeeze Roll	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
PRESS SECTION				
Doctor Oscillator Chain	Open	Hand application	Gargoyle D.T.E. Oil Extra Heavy	Apply by squirt can once weekly or as required
	Enclosed	Dip	Gargoyle D.T.E. Oil Extra Heavy	Check level every two weeks. Change oil every six months
Doctor Oscillator Worm	Enclosed	Dip	Gargoyle D.T.E. Oil AA	Check level every two weeks. Change oil every six months
Press Rolls	Anti-friction	Pressure fittings Circulation	Gargoyle Grease AA No. 2 Gargoyle D.T.E. Oil Extra Heavy	Apply grease gun every two weeks See directions issued by supplier, also general instructions on pages 5 and 6 of this booklet
Felt Rolls Paper Rolls	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
DRYER SECTION				
Dryer Bearings	Anti-friction Plain	Circulation Circulation with ring oiling	Oil Temperature Below 150° F. — Gargoyle D.T.E. Oil Extra Heavy 150-180° F. — Gargoyle D.T.E. Oil BB Over 180° F. — Gargoyle D.T.E. Oil AA	See directions issued by supplier, also general instructions on pages 5 and 6 of this booklet
Dryer Gears	Enclosed	Circulation	See recommendations for dryer bearings above	These gears are served by the same system as supplies the dryer bearings and the same instructions apply
	Open	Hand application	Gargoyle Viscolite No. 20 Fluid	Apply with brush or swab every two weeks Allow four hours for solvent in oil to evaporate

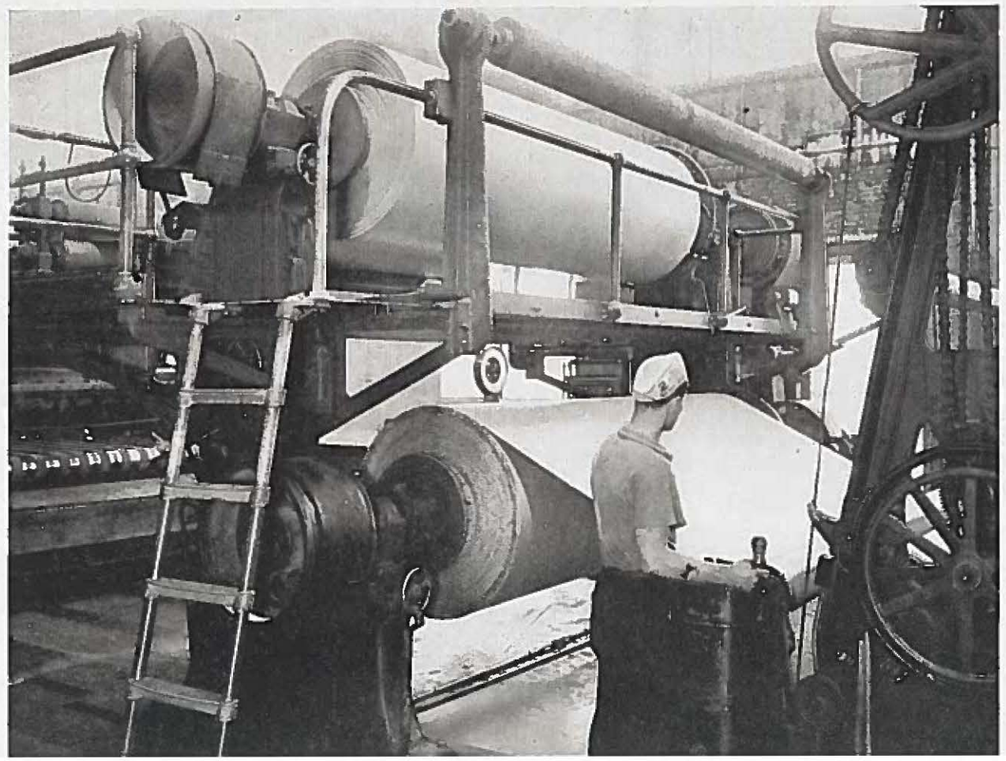
LUBRICATION CHART

Machine Parts	Type or Design	Method of Lubrication	Recommended Grade	Service Instructions
DRYER SECTION (Continued)				
Steam Joints	Anti-friction	Pressure fittings	Gargoyle Grease BRB No. 4	Apply grease gun every two weeks
Dryer Felt Rolls	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
Sheehan Carrier Sheaves	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
CALENDERS				
Bearings	Anti-friction	Circulation	Gargoyle D.T.E. Oil Extra Heavy	See directions issued by supplier, also general instructions on pages 5 and 6 of this booklet
Bearings	Plain	Ring oiled	Gargoyle D.T.E. Oil Extra Heavy	Check oil level every two weeks and add fresh oil as needed. Drain and refill once yearly
Bearings	Plain	Constant level oilers	Gargoyle D.T.E. Oil Extra Heavy	Refill oilers once every two weeks or as required
REELS				
Bearings	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun once monthly
Bearings	Plain	Ring oiled	Gargoyle D.T.E. Oil Extra Heavy	Check oil level once monthly and add fresh oil as needed. Drain and refill once yearly
WINDERS AND SLITTERS				
Bearings	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun once monthly
GEAR DRIVES				
Gears	Hypoid	Splash and circulation	Mobiloil GX	Check oil level every two weeks and add fresh oil as needed. Change oil at end of first month's operation and then every six months
	Spiral Bevel	Splash and circulation	Gargoyle D.T.E. Oil Extra Heavy	
Bearings	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
LINE SHAFTING				
Bearings	Anti-friction	Pressure fittings	Gargoyle Grease AA No. 2	Apply grease gun every two weeks
Bearings	Plain	Ring oiled	Gargoyle D.T.E. Oil Extra Heavy	Check oil level once monthly and add fresh oil as needed. Drain and refill once yearly



View of Bagley and Sewall Automatic High Speed Single Drum Reel on 178" Harper Fourdrinier Machine

Two Drum Jumbo Reel Designed and Built by Bagley and Sewall for operation on board machine



THE BAGLEY AND SEWALL HIGH SPEED WINDER

WITH AUTOMATIC UNLOADING DEVICE